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Abstract — Nowadays, the inadequacy of linear and mechanistic thinking (positivism/reductionism) in understanding both the source and the solutions of the many unwanted and undesirable biophysical and sociocultural impacts of modern agriculture, underlying that agriculture in its present (dominantly industrial) form is not sustainable, gives rise to multiple alternative proposals. The need to solve increasingly complex problems with a view to sustainability reinforces various 'cross-disciplinary' forms of learning and problem solving, 'integrating' perspectives and insights; cooperation by diverse academic experts and practitioners is called for. The current paper aims at addressing the dynamics of different forms of knowledge in the construction of knowledge, especially for sustainable (rural) development. In particular, the objective is to discuss the tentative contribution of Critical Realism (CR) in the understanding of the interfaces between different forms of knowledge (and their bearers/actors) in both theoretical and practical terms. CR with its realist, differentiated and stratified ontology claims, contra positivism, that science should aim at exploring the mechanisms which contribute to the generation of what is experienced. Therefore, it allows for new insights concerning 'cross-disciplinary' research and development intervention. Thus, the implications of CR, especially on the problem of 'transdisciplinarity' as well as on problems pertaining 'participatory processes', are addressed.

Key-words: Crossdisciplinarity, Critical Realism, Lay Knowledge, Science, Participation

Résumé — Actuellement, l'insuffisance de la pensée mécanique et linéaire (positivisme/réductionnisme) en ce qui concerne autant les sources que la résolution des plusieurs non intentionnelles et indésirables conséquences biochimiques et socioculturelles de l'agriculture moderne, désignant le fait que l'agriculture (industrielle) n'est pas durable, constitue l'allumeur pour l'apparition des plusieurs réponses alternatives. La nécessité de résolution des problèmes complexes, en relation avec la durabilité, fortifie les formes diverses d'apprentissage interdisciplinaire et la résolution des problèmes, à travers l'intégration des perspectives (approximations) et perspicacités, pour ça émerge l'appel pour la collaboration entre les scientistes/ experts des disciplines diverses et des professionnels/citoyens. La présente notification vise à l'examen des formes de connaissance (scientifique et publique) pour la création de la connaissance, surtout pour le développement de l'agriculture durable. Concrètement, l'objectif consiste la discussion de la jonction virtuelle du Réalisme Critique pour la compréhension des points d'interconnexion entre les différentes formes de connaissances (leurs porteurs/acteurs) autant en niveau théorique que pratique. Le Réalisme Critique avec son ontologie diversifiée et superposée, prétend, contre le positivisme, que la science doit viser la recherche des mécanismes qui contribuent à la naissance de celui qui empiriquement peut être aperçu. Par conséquence, il permet un nouvel envisagement de l'interdisciplinarité et de l'intervention progressive. Ainsi, la notification s'occupe des conséquences du Réalisme Critique et particulièrement l'interdisciplinarité et les problèmes des procédures participatives.

Mots clés: Interdisciplinaire, Réalisme Critique, connaissance populaire, science, participation

INTRODUCTION

Following the Brundtland Report (1987), the concept of Sustainable Development (SD) is widely cited in national and international policy documents and agreements. In parallel, it has been recognized that SD requires local action and the inclusion of non-state and non-scientific actors, implying consultation, capacity-building and empowerment of citizens (UNCED 1992). Such actors hold differentiated stocks of resources, including knowledge. A body of knowledge emerges out of complex processes and makes up the way people construct and interpret their world (Arce & Long 1992); knowledge is situated in the 'life-worlds' of those involved (Berger & Luckmann 1987). Thus knowledge is multi-layered in the sense that there is always a multiplicity of life worlds, interests and possible frames of meaning. It is also packaged in various and, at the same time, specifically bounded forms[1]. Each of these is guided by and refers to different rationalities as to what is effective or legitimate knowledge and thus informs different practices. In this respect, science is conceived of as a distinct, very powerful 'knowledge system', taken as definitional of knowledge, rationality or objectivity (Watson-Verran & Turnbull 1995). On the other hand, rural people's knowledge (lay knowledge) is 'situated', differs in its modes of experimentation and learning, and the validity of its contents is locally restricted (IDS 1979). Such characteristics make the relationship between these knowledge forms asymmetrical in terms of power, truth claims and communication (Chambers 1994). Moreover, in identifying, as is often the case, 'knowledge' with science and technological expertise, little recognition is given to the role of 'lay' citizens in knowledge generation and use (Koutsouris 2008). Nevertheless, the division between these forms of knowledge is contested and at least partially eroded in the public sphere (Beck 1992; Funtowicz & Ravetz 1993; Gibbons et al. 1999).

In the context of agricultural and rural development, the need to relate knowledge to specific socio-spatial contexts (localities), thus the need for interaction and dialogue between different actors and networks (the interpenetration of actors' life-worlds and projects; Long 1992) in order to realize sustainability, has been long pointed out (Chambers 1993; Scoones & Thompson 1994). However, while it is realised that flows of communication and exchange between different actors is extremely important for existing knowledge to be either reinforced or somehow transformed or deconstructed, thus leading to the emergence of new forms and a 'fusion of horizons' (Leeuwis et al. 1990), there is often a critical lack of communication and understanding between actors and networks (Koutsouris 2008).

'CROSS-DISCIPLINARITY': AGRONOMY AND RURAL DEVELOPMENT

Nowadays, various phenomena[2] underlie the claim that agriculture, in its present intensive-productivist form, is not sustainable. This is largely related to the exclusive focus of conventional agricultural development on techno-science and economic productivity (Roling 2003; Bawden 2005). Indeed, agrarian sciences have until recently been dominated by the paradigm of experimental science (also called 'reductionist science'), based on the reduction of complex wholes to their basic, more manageable fragments before an effort is made to predict a logical solution. It is by focusing on the individual parts and the relations between isolated variables that science has long aspired to understand the functioning of the complex whole. This, in turn, has resulted in a 'culture of technical control' implying reliance upon scientific experimentation to create a 'fix' for agricultural problems (Nerbonne & Lentz 2003).

[1] See: Tovey 2008 and Bruckmeir & Tovey 2008 - with reference to CORASON ('A cognitive approach to rural sustainable development'), a 30-month (2004–2007) cross-national project which was funded by the EU under its Framework Programme 6. CORASON set out to explore the dynamic relations between the different forms of knowledge revealed in development and sustainable development projects in rural settings.

[2] For example, climate change, pollution of the environment, food contamination and health challenges, reduction of biodiversity, soil erosion, BSE, as well as social inequities and poverty

Despite the fact that the achievements of positivism have been dazzling, alternative proposals have, since the 1970s, flourished based on the realization of the inadequacy of linear and mechanistic thinking in understanding the source and the solutions of problems. Since Dahlberg's (1979) contention that most intellectual maps of agriculture fail to perceive it as 'the basic interface between people and their environment', a growing body of literature has identified the social, cultural and political perspectives involved in sustainable natural resources management/NRM (and agriculture). That is, biophysical problems are not isolated but are likely to be associated with problems of social change and stress which, in turn, means that social and ecological systems have to be treated as a single coupled and dynamically complex system (Allison & Hobbs 2004). Consequently, a wide variety of approaches has been developed with the intention to integrate the 'social' and the 'natural' based on collaborative-participatory efforts, among which 'systems thinking' is prominent (Koutsouris 2009). A systems approach, in order to understand complexity, looks at a potential system as a whole (holistically) and focuses on the relationships (important causal inter-linkages or couplings) among a system's parts and on system dynamics, including human and organizational issues which are rather ignored in traditional approaches. Nowadays, the literature on NRM uses systems thinking and soft systems methodology (Checkland & Scholes 1990) to analyze how rural actors create multi-stakeholder relationships, with 'social learning' lying at the heart of multi-stakeholder processes.

The overall understanding that SD requires a shift in the way development is approached, has thus led to new concepts, theories, and metaphors to help understand and predict the links between the social, ecological, and economic systems, and meet the real world challenges to address sustainability. This has also led to the requirement to move across the boundaries of different scientific branches as well as between scientists and stakeholders. As a result, various concepts of 'cross-disciplinarity' have been developing (i.e. 'multi', 'cross', 'inter', 'trans', 'supra', 'meta' –disciplinarity, etc.) each used in a number of ways, from an instrumental sense that works within a disciplinary frameworks to more encompassing approaches that seek unity of knowledge. For example, Rossini & Porter (1981) distinguish among: 'Multidisciplinary Research', as comprising a number of independently performed studies with external coordination through appropriate editorial linkages; 'Transdisciplinary Research', considered to include the development of an overarching paradigm that encompasses a number of disciplines and (latterly) stakeholder groups; 'Interdisciplinary Research', falling between the two previous approaches: components being linked internally and substantively without being subsumed under a supradisciplinary paradigm. Similar distinctions are also abundant in literature. For Kockelmans (1979) 'cross-disciplinary' and 'pluri-disciplinary' work involves tight co-ordination among disciplinary parts, either in the form of finding a solution to a problem or in the form of the discovery of overarching conceptual framework. Lattuca's classification (2001) includes 'informed disciplinary' work which asks primarily disciplinary questions, while 'transdisciplinarity' refers to the application of theories, concepts, or methods with the intent of developing an overarching synthesis. Klein (1996) differentiates among 'instrumental interdisciplinarity' involving bridge building between fields, 'epistemological interdisciplinarity', that is, restructuring a former approach to defining a field, and 'transdisciplinarity' which seeks a movement toward coherence, unity, and simplicity of knowledge. Finally, Finkenthal (2001) endorses the view of a 'metadiscipline' and a new epistemological tool.

Among the most widely discussed 'transdisciplinary' approaches are those of 'Mode 2' (Gibbons et al. 1999; Nowotny et al. 2001) and 'post-normal' science (Funtowicz & Ravetz 1993). Both address the need for new perspectives on science especially in situations characterised by irreducible uncertainties and emergent complexity. Both underscore the need for science to become increasingly more accountable to society, i.e. argue for increased democratic legitimacy (increased participation and transparency) and more open and integrative forms of knowledge production (interactive knowledge-making towards a

more socially embedded and more closely tied to contexts of application science).

CRITICAL REALISM

Critical realism (CR), a philosophy for, not just of science, was developed as an alternative to positivistic models of science as well as an alternative to postmodern approaches. CR, in the first place, holds to the view that there is a mind-independent external reality and that it can be known; exploring and understanding the nature of that reality is the primary purpose of (scientific) research. Nevertheless, CR is distinct from empirical or 'naïve' realism since it does not assume a one-to-one correlation between knowledge claims and reality. CR acknowledges that there is a distinction between the way things are and our knowledge claims about those objects of knowledge. To conflate the two, i.e. to reduce ontology to epistemology is to commit what Bhaskar (1978) called an 'epistemic fallacy'. In this respect, CR proposes a distinction between the 'transitive' and the 'intransitive domain' of knowledge. The former consists of our theories, concepts and discourse of research, that is, of our knowledge of the world, while the latter of the real things and structures, mechanisms and processes, events and possibilities of the world which for the most part are enduring (invariant) and quite independent of us/our knowledge (Bhaskar op. cit.).

CR, while not presupposing some simplistic privileged access to reality, believes in the possibility that some things that exist in the intransitive dimension can become progressively known. Indeed, that is the reason in undertaking research; science aims to explore and understand the world and its structures (the intransitive dimension of reality) through socially produced theories (transitive) that are potentially fallible and limited (Outhwaite 1987). CR thus acknowledges the fallibility of knowledge claims (Bhaskar 1978) as well as that they are relative to the historical, social and political context in which they were produced. Therefore, CR agrees with those characterised as weak social constructivists that 'there is no neutral access to the world' (Sayer 2000)[3]. However, this does not imply that knowledge is totally arbitrary or, that it cannot successfully identify real objects (Sayer 1992). Moreover, CR acknowledges that some claims about the nature of this reality may provide better (more accurate) accounts than others, or our 'best shot' at explaining the world; some approximations of reality can be better than others[4].

Furthermore, CR relies on a stratified account of reality (ontological depth) thus distinguishing: (1) the empirical; (2) the actual; and (3) the real domain. The 'empirical' consists of our experiences/observed events; the 'actual' is constituted by events, independently whether we experience them or not; and the 'real' comprises causal powers and deep structures or what might, metaphorically, be called mechanisms with generative power, i.e. the power to produce events (Bhaskar 1978; Collier 1994; Outhwaite 1998; Sayer 1992). Crucially, these mechanisms are circumstantial rather than deterministic. They may or may not be exercised, depending on contingently related conditions; therefore they are seen as 'tendencies'. Thus, the aim of (CR) research is to uncover these mechanisms, acknowledging that they may or may not be exercised. Indeed, it is the 'real', i.e. the intransitive mechanisms what makes scientific investigation both meaningful and necessary.

Such a line of argument about generative mechanisms and counter acting mechanisms points to the importance of context. Given that all events are produced in, more or less, highly complex contexts, the outcome of a mechanism is always dependent of the particular

[3] CR is hostile to strong forms of constructionism for they do not allow for fallibility. Positing that all knowledge claims are equally privileged social constructs such theories are incapable of any critique or transformation project. Furthermore, although they claim to reject epistemological positions of universality, they do so by paradoxically proscribing their own universal, i.e. that all knowledge claims are of equal validity (Carolan 2005).

[4] Bhaskar's realism (1991) suggests that a theory Ta is preferable to another theory Tb (even if they are incommensurable) if Ta can explain under its description almost all the phenomena Tb can explain under its description plus some phenomena that Tb cannot explain.

situations and contexts in which it is active; processes are always contextually determined. It follows that research has to be conducted in accordance with the context within which the phenomenon under study is manifested. If it is possible to 'close' the system, i.e. to put an experiment in place and thus keep other mechanisms under control, certain methods can be applied (natural sciences can often artificially mimic such 'closures in experiments). However, in the social sciences 'closed' conditions are neither existent nor can they be established artificially; hence natural sciences' 'best-practice' is not possible for social sciences which, in turn, require specific methodologies designed for 'open' systems

Furthermore, CR argues that reality consists of hierarchical ordered layers/strata (Bhaskar 1978; Collier 1994). Each of these has its own generative mechanisms; indeed, it is the existence of specific mechanisms that constitutes each of the layers. Crucial concepts within this perception of stratification are those of rootedness and emergence (Bhaskar 1978). That is, although a 'lower' level creates the conditions for a 'higher; level, the latter is not determined by the former; each 'higher' layer is qualitatively different from the 'lower' one with the former's mechanisms emerging, i.e. not being reduced to or determined by the latter's mechanisms. Causal tendencies are multidirectional (both 'upward' and 'downward'); layers are not independent and closed; in parallel, such a conception of dynamic tendencies does not allow for determinism. Within CR there is thus an ongoing discussion concerning the identification of layers and their relations. In this respect, a simplified description may be as follows (from 'lower' to 'higher'): molecular – biological – psychological - social sciences. These layers, in turn, are (usually) addressed by specific, relevant disciplines.

The nature of knowledge

For CR, knowledge, including science, shares with all other social products the basic conditions that it is produced in a context of work (material intervention) and communicative interaction with other people (Sayer 1992); knowledge is the outcome of work (either as the intended product of scientific work or the tacit concomitant of everyday work). Thus, the differences between two subjects with differing backgrounds and objects are determined by their practices, in terms of the conceptual tools they use and material actions and social relations in which they engage. Nevertheless, the practical relation between knowledge and reality does not imply that knowledge is true as soon as it is useful to someone. For CR, the usefulness of knowledge is a question of how well concepts capture the generative mechanisms in the objects under study. According to Sayer (1992) "Knowledge is useful where it is 'practically-adequate' to the world".

More specifically, as far as the relation between lay and scientific knowledge is concerned, in the first place, it must be stressed that the latter presupposes the former as well as that much of the lay knowledge is tacit. Further, the origin of theoretical knowledge is practical breakdowns which, in turn, trigger the need for explanatory knowledge, i.e. for a new kind of work with cognitive aims (science) (Collier 2003). Additionally, science, although being in all fundamental respects like any other knowledge, signifies examined concepts, that is, it consciously and systematically reflects upon them in order to be consistent and at a higher level of integration (Sayer 1992). Therefore, scientific knowledge is something else and something beyond more unreflective everyday knowledge based on traditions, conventions and practical considerations 'here and now' (Danermark et al 2002).

The consequence is that there will inevitably be more or less of a competition between lay and scientific knowledge. Thus, the issue of how concepts and values of lay knowledge are integrated in research is extremely important. For CR, the contents of lay knowledge constitute the immediate mechanisms behind activities; it follows that accounts of the research participants are valid scientific data (Bhaskar 1989) or the 'raw material' that scientific knowledge must systematically include, if theories are to be valid. A lay conception of a phenomenon (correct or false) is important information to the researcher; it may be an essential aspect of the phenomenon itself, even if wrongly understood. Furthermore, even if

false, it is nevertheless real – it exists, informs and motivates concrete actions. Therefore, research must attempt to report those ideas, as they are held, and show in what respects they are correct or false. Moreover, within the effort to understand and explain phenomena, research cannot avoid evaluating and criticizing societies' own self-understanding. The key element to CR's 'explanatory critiques' is that "the ideas integral to a society can be logically contradictory, and to show that they are, is to criticise them and so to criticise that society" (Bhaskar & Collier 1998). This, in turn, allows for consequential social transformation.

It has to be reminded that although knowledge can have objective effects this does not mean that its understanding of the referents is objective or adequate. Both researchers' and (lay) actors' knowledge is fallible. In science, too, and despite our efforts, we tend to see only some aspects of reality and are blind of others. Moreover, science can carry out experiments that are morally wrong, be shoddy (impaired 'objectivity' in commercial and military research), or the application of its findings can come about in ways that are immoral (commercial and military uses). Such cases certainly call for public inspection and accountability.

Cross-disciplinarity and CR

CR's view implies a shift of focus towards the complex interaction of (generative) mechanisms sometimes resulting in empirical manifestations, sometimes not due to counteracting factors. This as well as the understanding that such mechanisms work at different layers of reality have serious implications for 'cross-disciplinary' (especially interdisciplinary) research. First, according to CR interdisciplinary research implies analysing in common a phenomenon at different layers/levels; researchers then use different theories (and concepts) developed in order to explain and understand the phenomenon's manifestation at (their) respective layers. Second, as Sayer (1992) argues, the choice of method or approach must suit the object of investigation as well as the purpose of it. Consequently, CR argues in favour of methodological pluralism, which, against methodological relativism and imperialism, means that different methodological approaches have been developed according to the specificities of each layer. Methods developed for one layer are seldom suitable for another layer; methodological designs must differ between layers (and relevant disciplines) according to the degree of possibilities to close a system[5]. Moreover, according to Archer (1998), research should strive for both horizontal explanation, i.e. the explanation of events by the mechanisms which generate them, and, vertical explanation, i.e. the explanation of one mechanism by another more basic one.

CR's approach is thus quite different from the alleged attempt at unifying theories, concepts and methods. For CR such unification is not possible; CR argues for the necessity of a 'multidisciplinary' approach given the non-reducible layers of reality (Carolan 2005). Nevertheless, this is not to conclude that a phenomenon can be analysed independently by a range of disciplines and then results can be added; results must be integrated to reach a more holistic explanation of the phenomenon. Therefore, for CR the integrative part of the research process concerns the integration of knowledge about a complex phenomenon. This, in turn, has a further corollary: researchers, in order to be able to understand what is happening at layers beyond their expertise (i.e. how mechanisms work at other levels and influence the outcome) need to have some knowledge of other disciplines. It finally implies that no type of knowledge has priority; all levels are necessary to fully grasp a phenomenon. Research is thus a democratic activity implying tolerance for different perspectives.

Transdisciplinarity and CR

Further to the possibilities of 'integration' of various disciplines in research, 'transdisciplinarity' additionally aims at integrating 'lay' with 'expert' knowledges. In this

[5] Sometimes phenomena addressed by natural sciences are also very complex such as climate change. On the other hand, sometimes it may be necessary to address some higher level phenomena, for example in psychology, by trying to reduce the number of contingent factors.

respect, the different tasks and thus approaches taken between experts and practitioners have to be pointed out. As already mentioned, according to CR, scientists try to identify and analyse mechanisms at the level each of them is trained. This specialisation, in turn, often implies a (more or less, huge) gap between research and practice; often research does not correspond (straightforward) to the everyday reality of the practitioner, i.e. the 'whole' (complex phenomenon) with which the practitioner is confronted. As a result, the effort of scientists to become concrete and 'practical' (i.e. to move from the abstract/real to the empirical domain) may result in conflicts. This is often the case, since practitioners are likely to expect research to provide them with as accurate predictions for practice as possible. But, as already mentioned, the experiential outcome of a mechanism 'depends' on the interplay between mechanisms at various levels and the specific context; research thus in many cases can only provide knowledge about mechanisms and tendencies, i.e. with very little value for an accurate prediction (that is, for rules for practical action).

Therefore, the expectation that research will result in practical recommendations is problematic. Sciences (especially the abstract ones) should not be allowed to influence practice directly; the need for concrete analysis to bring in all sorts of factors that do not figure in the particular science, thus for concrete knowledge to guide practice, should not be overlooked (Collier 2003). Furthermore, the use of research findings, for example, that 'w' is the more economical way to produce 'x', is, in many cases, confronted by a multiplicity of incommensurable reasons for using or not using 'w-in-context'.

The consequence of this differentiation of knowledge forms between scientists and practitioners is that the relation between the two parties cannot but be a reciprocal learning process. That is, the practitioner, confronting the whole complex phenomenon, can provide research with insights on how mechanisms and/or their interplay are empirically manifested thus allowing researchers to further develop their knowledge. On the other hand, practitioners can learn how mechanisms work at different levels and thus increase their knowledge and understanding of the outcome of the complex interplay of such mechanisms/factors.

PARTICIPATION

Related to this discussion is the fact that, nowadays, it is difficult to find development projects that do not in one way or another claim to adopt a 'participatory' approach. A basic principle, among others, of community participatory methods is that the starting point should be the internal knowledge, priorities and perceptions of local people (Chambers 1993; Oakley 1991); therefore, the importance of indigenous (or local/lay) knowledge and competence. It follows that, although their application is still challenging, interactive approaches characterized by 'knowledge integration' are of extreme importance.

In the context of the issues addressed in this paper two major points emerge. The first concerns one among the 'external' obstacles prohibiting participation: that participatory approaches may well convey 'hegemonic' decisions owing to experts' attitudes that 'they know best' and thus have the monopoly of solutions which they aim to transfer to the local communities who by definition 'know less'. Indeed, in many projects, 'participatory' processes begin only after the project has been already designed; 'participation' is meant to promote the legitimatization and acceptance of already taken decisions - to convince 'beneficiaries' about what is 'good for them' (Botes & van Rensburg 2000). As a result, in most such cases experts propose answers that address the wrong question, which, in turn, leads to a high proportion of failures[6]. When people are offered specific ways in which they should

[6] Such an attitude may have further repercussions, such as: perceived (on the part of the experts) commonality with respect to the problem as well as homogeneity of the community addressed (Quaghebeur et al. 2004), selective participation (Botes & van Rensburg 2000) and 'hard-issue' bias (Mosse 2001).

'participate' (they have to participate but this opportunity is offered by the project indeed under prescribed conditions) the 'paradox of participation' arises (Quaghebeur et al. 2004).

The second issue refers to participatory techniques, which, nowadays, have become an obligatory part of 'bottom-up' development efforts. Among other considerations, such as an overpreoccupation with methods and the unrealistic confidence in the efficacy of methods per se, an issue directly related to CR is that participatory techniques easily fall into the trap of empiricism. Based on the premise to take participants or stakeholders seriously and to fundamentally base project activities on their knowledge, needs and interests, they heavily rely on empirical information provided by project participants. As Henkel and Stirrat (2001) note, the 'participation orthodoxy' celebrates the local, indigenous and marginal at the expense of the antipathetic and deprecated technical or scientific. However, for CR such an implicit ontology (based on experience) confuses the 'empirical' with the 'real' domain (Subramaniyam 2007). As argued by Sayer (2000) "Observability may make us more confident about what we think exists, but existence itself is not dependent on it". Furthermore, taking participants seriously is never neutral. Not only is the 'local' shaped by power relations but the articulation of 'needs', as expressed by locals, is influenced by projects themselves in the sense that the objectives of the project and local's perceptions of what the project is able to yield shape 'needs' (Quaghebeur et al. op. cit.). Finally, in many cases, the context is largely ignored (Warner 1997). Then, leap service is paid to development in so far as various factors (economic, social, cultural, political, environmental, psychological and historical) affecting the generation and use of knowledge, as well as the wider (development) context, are oversimplified. Therefore, on the one hand, generative mechanisms are ignored and, on the other hand, choice is limited (re: poor knowledge of opportunities) and the 'establishment' is not challenged.

AFTERMATH

Nowadays, 'transdisciplinary' approaches experiment with dialogical forms to find common ground between different knowledge forms as a basis for establishing regimes of sustainable NRM and rural development; coproduction of knowledge between 'expert' and 'lay' knowers is thus sought after (Tovey 2008). On its part, CR based on its realist, differentiated and stratified ontology claims that research entails the examination of a range of possible generative mechanisms and the study of those which, in the particular context examined, have the most impact. Given that many of the sociobiophysical effects are beyond direct perception ("epistemologically distant" from us; Beck 1992), it is necessary to be able to speak of things that cannot be directly observed (and are, thus, beyond the level of the empirical), but which are real nevertheless. This is crucial as it is "*the recognition of the possibility that powers may exist unexercised and therefore what has happened or been known to have happened does not mean this is the limit of what could happen or have happened, this therefore makes it possible to understand how we could be or become many things which currently we are not*" (Sayer 2000). Transformation is thus dependent 'upon the transformation of structures, not the alteration or amelioration of states of affairs' (Bhaskar 1998). In this respect, it must be recognized that facilitating peoples' self-enlightenment as to unwanted determinations or illusions is not a sufficient condition, for transformation "to take place the mechanisms generating the problems must be removed or blocked" (Sayer op. cit.); CR's explanatory critiques aim at exposing "not just false beliefs, but the false beliefs by which oppression and injustice are disguised, whether consciously or not, and perpetrated" (Bhaskar & Collier 1998). As such, this approach favors cooperation of knowers (albeit in different roles) in knowledge building and use as well as requires critical reflection, probing and questioning with some realignment of perspectives which may, hopefully, act as a mediating force for social praxis.

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